INNOVATIONS IN CLINICAL PRACTICE

Computerized Condition-specific Templates For Improving Care of Geriatric Syndromes in a Primary Care Setting

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INTRODUCTION: As the U.S. population ages, primary care clinicians (PCCs) will encounter more patients with geriatric syndromes, such as urinary incontinence (UI) and falls. Yet, current evidence suggests that care of these conditions does not meet expected standards and that PCCs would benefit from tools to improve care of these conditions. Little is known about the role of computerized condition-specific templates for improving care of geriatric syndromes.

AIM: We sought to develop and assess the usefulness of condition-specific computerized templates in a primary care setting.

SETTING: A large academic Veterans Affairs medical center.

PROGRAM DESCRIPTION: We developed and tested the usefulness of 2 condition-specific computerized templates (UI and falls) that could be added on to an existing electronic health record system.

PROGRAM EVALUATION: Semistructured interviews were used to identify barriers to use of computerized templates. Usefulness and usability were assessed through a randomized-controlled trial involving standardized patients.

DISCUSSION: Use of condition-specific templates resulted in improved history and physical exam assessment for both UI and falls ($P < .05$). Our computerized, condition-specific templates are a promising method for improving care of geriatric conditions in a primary care setting, but require improvement in usability before widespread implementation.

KEY WORDS: quality of care; geriatrics; decision support; templates.

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As the U.S. population ages,¹ general internists will encounter more patients with geriatric conditions. Yet, studies indicate that current care of geriatric syndromes falls short of expected standards.^{2,3} In a study of community-dwelling frail elders, providers only delivered 29% of recommended urinary incontinence (UI) care and 34% of recommended falls-related care.² Several quality improvement programs have been developed to improve care of geriatric conditions.^{4,5} Recently, the Assessing Care of Vulnerable Elders (ACOVE) project demonstrated that implementation of a multicomponent program aimed at primary care physicians resulted in improvement in care of UI ($P = .001$) and falls ($P < .001$).⁶ One of the main components of this program was the introduction of pen-and-paper templates to help clinicians collect information

during the patient encounter and develop a plan of action for several high-risk conditions, including UI and falls.⁷

Many clinicians use templates to help collect and document information during patient encounters, but few studies have tested the effects of condition-specific templates.⁷ A study using complaint-specific paper templates in a tertiary care emergency department showed improvement in documentation of important history and physical elements and diagnostic studies for a variety of common conditions.⁸ More recently, a randomized-controlled trial conducted in a family medicine clinic demonstrated that use of a condition-specific paper-template system was associated with improved billing when compared with undirected written documentation.⁹ One of the challenges of using templates for quality improvement is that primary care clinicians (PCCs) often address multiple complaints at any given visit,¹⁰ and therefore, paper templates that focus on single conditions are unlikely to fit into the workflow of a busy practitioner. Electronic health records (EHR) can provide the flexibility and features^{11,12} necessary to allow condition-specific templates to become useful clinical tools. Currently, however, we lack a basic understanding of the features that make electronic condition-specific templates useful and usable.

The Veterans Health Administration's (VHA) EHR is regarded by national leaders as a model for developing other EHR systems.¹³ In widespread use since 1998, the VHA's EHR, Computerized Patient Record System (CPRS),¹⁴ supports the use of templates, which are "precompiled boilerplates that can contain text and imbedded objects."¹⁵ The VHA provides care to many elderly patients¹⁶ and uses a delivery model that relies heavily on the use of PCCs.¹⁷ Given our federal government's commitment to the establishment of EHRs for all Americans¹⁸ and the need for clinical tools to help PCCs care for an aging population, we sought to develop templates that could be added onto EHRs for 2 geriatric conditions. We selected the VHA as our target organization.

There is increasing recognition that interventions, such as computerized decision support systems, require a structured development process and that many systems have not gone through such a process.^{19,20} Before large-scale trials are conducted, smaller studies should be conducted using qualitative methods to explore the effects of the proposed interventions, followed by studies of the intervention in an artificial setting.

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These initial steps allow investigators to identify early on problems with the system and to determine the applicability of the intervention.¹⁹ The next step should involve a test of feasibility to determine whether the intervention can be used in practice. Only after these steps are completed should large-scale tests of effectiveness and assessments of widespread implementation take place.¹⁹

AIM

We aimed to develop prototypes of computerized condition-specific templates for 2 geriatric conditions, UI and falls, for use in primary care encounters and to test the applicability of the templates in a laboratory setting, using methods that have been suggested for development of computerized decision support systems.

SETTING

We conducted our study in a large academic VHA medical center located in Los Angeles, California. The study took place between August 2004 and August 2005.

Program Description

Understanding Template Use in Primary Care Before Developing Condition-specific Templates. We conducted 8 semistructured interviews with clinicians to explore specific barriers and facilitators to use of templates. Clinicians who provide care to patients in a primary care clinical setting and/or have experience with developing computerized clinical tools at a local medical facility were included. Through these interviews, we identified barriers that we later considered when we developed our templates. These issues included (1) making templates flexible to enable clinicians to address complaints unrelated to the target condition; (2) providing entry fields that allow clinicians to capture the individuality of and subtle difference between patients; (3) developing entry fields that do not force or promote the inclusion of false or misleading information; (4) constructing a user-friendly interface that does not decrease the clinician's interaction with the patient; and (5) producing template output that is readable (formatted).

Developing the Condition-specific Templates (See Figs. 1 and 2). Our local computer department programmed the initial template prototypes, adapting content and format from the paper templates developed for the ACOVE project.⁷ To address each of the major concerns raised in the semistructured interviews, we also took the following steps when developing the prototypes: (1) divided each template into subcomponents (e.g., UI history, UI physical exam, UI diagnostics, UI assessment/plan) and enabled clinicians to access and insert each of these subcomponents into any part of the clinic note; (2) provided a combination of prespecified responses and free text fields; (3) required all entries to be active responses (no default responses); (4) sequenced the prompts in a logical and clinically meaningful manner; and (5) adjusted template formatting to eliminate excess spacing and inappropriate breaks in lines.

We then modified the templates, adapting a method based on iterative usability testing, as described by Kushniruk and Patel.²¹ This process involved cognitive interviews with 10 PCCs, a sufficient sample size to detect 80% of surface-level usability problems.²¹ Subjects reviewed the templates for

FIGURE 1. Example of urinary incontinence template—history component. The clinician records information in a new clinic note (e.g., the chief complaint, history of present illness). If the patient reports urinary incontinence (UI), the clinician can activate the UI history template (see arrow). The clinician enters the information into the template, which appears only after the template is activated (inset).

content, usability, and functionality, and iterative changes were made based on information collected through the interviews.

Testing the Applicability of Condition-specific Templates. Applicability of the templates was tested in a primary care clinic setting. We recruited a convenience sample of 16 PCCs from a local VHA medical facility, stratified them based on years of clinical experience, and randomized each clinician to templates versus the usual care group. We recruited clinicians with a broad range of interest in using IT for patient care, years of clinical experience, and years in the VHA. Physicians and nurse practitioners were eligible to participate. All clinicians

FIGURE 2. Detailed view of note with template output. When the clinician has completed the template, the clinician can insert the template output in any part of the clinic note by placing the cursor in the desired location. Then, the clinician can continue entering into the clinic note additional history unrelated to urinary incontinence (e.g., follow-up on hypertension, rash, etc.). When the clinician is ready to perform the physical exam, the physical exam template can be activated and the output can be inserted into the appropriate part of the note.

Table 1. Characteristics and Attitudes of Subjects Toward Templates

Item	Total Respondents	Mean (SD)	P Value*
(1) How often do you use templates (exclude clinical reminders) for your primary care clinic encounters? [†]			
Templates group	8	2.4 (1.7)	1.00
Control group	8	2.4 (1.7)	
(2) In general, I feel that templates are useful in helping me to provide patient care [‡]			
Templates group	7	6.1 (1.1)	.78
Control group	7	6.3 (0.8)	
(3) Overall, I feel comfortable using templates [‡]			
Templates group	7	6.0 (1.4)	.65
Control group	7	6.3 (0.8)	
(4) I believe I am more productive when using templates [‡]			
Templates group	6	5.5 (1.6)	.57
Control group	7	6.0 (1.4)	
(5) In general, whenever I make a mistake using templates, I can easily and quickly correct my mistake [‡]			
Templates group	7	5.4 (1.3)	.05
Control group	6	6.7 (0.5)	
(6) Overall, templates at my facility are effective [‡]			
Templates group	6	5.3 (1.7)	.82
Control group	7	5.6 (1.9)	
(7) In general, templates are more useful in principle than they are in practice [‡]			
Templates group	7	4.3 (2.1)	.08
Control group	6	2.3 (1.5)	
(8) My lack of computer skills impedes my use of templates [‡]			
Templates group	7	1.1 (0.4)	.07
Control group	7	3.4 (2.8)	
(9) I prefer not to use the computer while with the patient [‡]			
Templates group	7	1.6 (1.1)	.26
Control group	8	2.7 (2.4)	
(10) In general, I need to make notes on paper that I later use to complete templates [‡]			
Templates group	6	1.5 (1.2)	.03
Control group	8	4.0 (2.3)	

Boldface signifies *p* value is less than .05.

*Analysis performed using Student's *t*-test.

[†]Possible range 1 to 5, where 1 = "always" and 5 = "never."

[‡]Possible range 1 to 7, where 1 = strongly disagree and 7 = strongly agree.

had used the VHA's EHR for at least 6 months. Clinicians randomized to the usual care group used the same EHR as the intervention group, but did not have access to the templates developed in the study. Each subject evaluated 2 standardized patients (SPs), who had been trained by an individual with extensive expertise preparing actors to be SPs for a medical school curriculum. Standardized patients, which are a feasible and practical way to measure quality,²² were used to decrease the variance associated with patients. One SP was an elderly male with new UI, while the other was an elderly male with recent falls. Both groups were given the same amount of time to complete their assessment and documentation (30 minutes). All subjects were aware that the patients were SPs, not actual patients.

We collected information about usefulness and usability immediately after the SP visit through a self-administered questionnaire adapted from the IBM Computer Usability Satisfaction Questionnaire (available at <http://www.acm.org/~perlman/question.cgi>). To measure the impact of the templates on quality of care, a senior nurse with extensive experience in quality assessment reviewed each SP's medical chart and abstracted information necessary to implement a subset of ACOVE performance indicators. The ACOVE indicators, which were developed using the RAND/University of California, Los Angeles-modified Delphi method,²³ are a group of validated performance indicators for measuring the care of frail elders.²³ Examples of the types of information abstracted include whether basic history and physical exam evaluations for UI and falls took place during the visits.

The VA Greater Los Angeles Healthcare System and RAND Corporation institutional review boards reviewed and approved all parts of the study.

Statistical Analysis

Descriptive statistics summarize the information collected with the self-administered questionnaire on perceived usefulness and usability of the templates. Parametric (*t*-test) and nonparametric methods were used to assess for differences in baseline clinical experience and perceived usefulness and usability of clinic note templates. Chi-square and Fisher's exact tests were then used to compare ACOVE performance measurement scores in the intervention group with the usual care group.

PROGRAM EVALUATION

Questionnaire Results

Clinicians in the control and intervention groups had practiced medicine for a similar number of years ($P=.70$). Overall, no significant differences in the attitudes or baseline use of templates were observed between the control and intervention groups (Table 1). Only responses to the question assessing the use of handwritten notes during the encounter reached statistical significance ($P=.03$). Self-efficacy in recovering from template-related mistakes was marginally significant ($P=.05$). Clinicians assigned to the intervention group provided feedback about the usability of the templates. Although they found

Table 2. Perceived Usefulness and Usability of Condition-Specific Templates (n=8)

Item*	Mean (SD)
(1) I am satisfied with how easy it was to use the structured visit notes or templates	4 (1.8)
(2) It was easy to learn to use the structured visit notes or templates	5 (1.7)
(3) The speed of the computers impeded the use of the structured visit notes or templates	1 (0)
(4) I was able to efficiently complete my work using the structured visit notes or templates	4.2 (1.4)
(5) I felt comfortable using the structured visit notes or templates	3.7 (2.0)
(6) The structured visit notes or templates unnecessarily duplicated the information I usually include in my clinic notes	4.9 (1.4)
(7) Whenever I made a mistake using these structured visit notes or templates, I easily and quickly corrected my mistake	4.2 (1.9)
(8) It was easy to find the information I needed on the structured visit notes or templates I used today	3.5 (1.9)
(9) The information provided for these structured visit notes or templates was easy to understand	5.2 (1.9)
(10) The organization of information on the system screen was clear	4.5 (2.3)
(11) I liked using the interface of these structured visit notes or templates	3.7 (1.8)

*Possible range for each item was 1 to 7, where 1=strongly disagree and 7=strongly agree.

the templates moderately helpful, they seemed somewhat ambivalent as to ease of use, with mean responses in the 3 to 4 range (1=strongly disagree and 7=strongly agree) (Table 2). The subjects thought that the templates were relatively easy to learn to use (mean 5.0) and that the information on the templates was easy to understand (mean 5.2). The subjects did not feel that the speed of the computer impeded use of the templates (mean 1.0).

Quality Scores

Quality scores for the intervention versus control group, by condition (UI and falls), are presented in Table 3. Clinicians

who used the condition-specific templates were more likely to pass the history-related performance indicators (UI: $P=.003$; falls: $P=.038$). Template use was associated with performing more of the indicated physical exam elements related to UI ($P=.013$). For falls physical exam assessment, template use was not associated with better performance of the falls-related physical exam when a threshold of 4 of 5 elements was used. In both the template and the control group, only 1 encounter reached this threshold. However, in preplanned analyses using a threshold of 3 of 5 elements, we found that more clinicians who used the falls template passed the performance indicator ($P=.038$). Other projects that have used the ACOVE performance measures to assess quality have also scored the

Table 3. Quality Scores for Condition-Specific Templates Group versus Control Group

Performance Indicator	Percent Passed		P Value*
	Templates Group (n=8)	Control Group (n=8)	
(1) Urinary incontinence (UI) history: if a vulnerable elder [†] has new UI that persists for over 1 mo or UI at the time of a new evaluation, then a targeted history should be obtained that documents each of the following: (1) characteristics of voiding; (2) ability to get to the toilet; (3) prior treatment for UI; (4) importance of the problem to the patient; and (5) mental status	100	25	.003
2) UI-targeted physical exam: if a vulnerable elder has new UI that persists for over 1 mo or UI at the time of a new evaluation, then a targeted physical exam should be performed that documents (1) a rectal exam and (2) a genital system exam	100	37.5	.013
(3) UI urinalysis/urine culture ordered: if a vulnerable elder has new UI that persists for over 1 mo or UI at the time of a new evaluation, then a dipstick urinalysis or urine culture should be obtained	100	75	.233
(4) UI discussion of treatment plan: if a vulnerable elder has new UI that persists for over 1 mo or UI at the time of a new evaluation, then treatment options should be discussed	100	100	Not tested
(5) Falls assessment history: if a vulnerable elder reported 2 or more falls in the past year, or a single fall with injury requiring treatment, then there should be documentation of a basic fall history (e.g., circumstances, chronic conditions, medications, mobility)	50	0	.038
(6) Falls assessment evaluation exam (full criteria—4 of 5 elements required): if a vulnerable elder reported 2 or more falls in the past year, or a single fall with injury requiring treatment, then there should be documentation of a basic fall examination (including elements related to orthostatics, visual acuity or eye exam in the past year, balance, station, gait, neurologic exam) that resulted in specific diagnostic and therapeutic recommendations	12.5	12.5	.533
(7) Falls assessment evaluation exam (relaxed criteria—only 3 of 5 exam elements required): if a vulnerable elder reported 2 or more falls in the past year, or a single fall with injury requiring treatment, then there should be documentation of a basic fall examination (including elements related to orthostatics, visual acuity or eye exam in the past year, balance, station, gait, neurologic exam) that resulted in specific diagnostic and therapeutic recommendations	100	50	.038
(8) Falls assessment gait/balance evaluation: if a vulnerable elder is found to have new or worsening difficulty with ambulation, balance, and/or mobility, then there should be documentation that a basic gait, mobility, and balance evaluation was performed within 3 mo that resulted in specific diagnostic and therapeutic recommendations	37.5	25	.359

Boldface signifies p value less than .05.

*Analysis performed using Fisher's exact test (2-sided).

[†]Vulnerable elder, individuals ≥ 65 who are at increased risk for functional decline and death (7.5 increased odds of mortality or functional decline over a 2-year period), based on self-reported physical limitation, IADL or ADL disability, self-rated health, and age.²⁶

ADL, activities of daily living.

falls physical exam using 2 different thresholds, because a threshold requiring assessment of 4 or all 5 components was deemed too difficult a standard, and the exact number of components necessary to achieve the effect of a multicomponent falls examination is not known.⁴ There was no effect of the falls template on gait/balance performance assessment. Use of the UI template did not lead to more urinalysis/urine culture orders ($P=.233$) or discussion of UI treatment options, as care in the control group was already high for both these criteria.

DISCUSSION

Condition-specific templates can serve as guides for clinicians, so that they ask questions and perform elements of a physical exam that experts in the field rate as necessary.² To our knowledge, this is the first study to assess the usefulness and usability of computerized templates for improving falls and UI care in a primary care setting.

The study demonstrates that a set of templates can be developed within an existing EHR system and that these templates can be used within the primary care encounter. With the expected proliferation of EHRs, the number of opportunities to develop electronic tools is likely to increase. Although the results of the project, a set of prototypes, are not ready for wide-scale implementation, this paper describes some of the steps that may be necessary to develop a usable template-based decision support system. Our project demonstrates the use of semistructured interviews and a survey to identify potential implementation barriers and the utility of a set of validated performance measures for measuring the usefulness of the templates. It also reveals some of our methods' limitations in developing a usable system.

Semistructured interviews with key informants in our institution guided development and testing of the templates. The interviewees told us about previous failed attempts at developing and implementing templates for PCCs and helped us identify features that would make our templates more helpful. They also identified strengths and weaknesses of other similar electronic tools (e.g., electronic clinical reminders) that might also apply to templates. For example, we applied comments about the output of the clinical reminders and about the user interface to development of the templates.

However, survey results revealed a range in perceived usability of the computerized templates, despite our use of cognitive interviews and an iterative process during the development of the templates. One of the main concerns raised was perceived unnecessary duplication of information that is already included in clinic notes (mean rating=4.9, SD 1.4). Perceived ease of use of the templates was moderate, with most responses ranging in the 4 to 5 range of the scale (scale range 1 to 7). We suspect that usability would have improved with repeated use of the templates. Nevertheless, we also believe that a steep learning curve is a barrier to regular use and that additional steps to improve usability should be considered. Providing clinicians with the skills and opportunity (e.g., a lunchtime hands-on workshop) to customize the templates is one method of improving the usability.²⁴ A strength of the templates is that they were built with tools that are readily available to all providers in the health care system and could easily be edited and uploaded into an individual clinician's template folder. This process would enable clinicians to remove parts of the template that they perceive as unhelpful, customize the

layout of the output so that spacing and headers are compatible with their writing style, modify the layering of the templates to make them more usable (e.g., some clinicians voiced preference for fewer drill-down layers to avoid the need for excessive mouse-clicking), and edit the template prompts that are not consistent with their management style. These steps would also give clinicians the opportunity to balance comprehensiveness versus acceptability (i.e., fewer template prompts would make the template quicker to use, but may sacrifice completeness). After providing clinicians with the skills to modify the templates, we would consider scheduling a follow-up, moderated group session with the clinicians to allow for exchange of ideas and experiences with their individualized templates.

Despite only moderate usability and our small sample sizes, we demonstrated through the use of validated performance measures that the templates are a promising method of improving processes of care for UI and falls. Templates may be particularly useful for prompting clinicians to obtain appropriate elements of the history, because clinicians can ask the prompted questions as they are typing their note. Our results suggest that overall the templates prompted clinicians to ask important questions and to perform physical exam elements related to UI and falls. The templates had less impact on the physical exam. For the falls template, the majority of clinicians in both the control and templates group failed when we required 4 of 5 elements of the exam to be performed. One explanation is that clinicians in both groups did not know how to perform an entire list of exam items described in the template or did not believe that all of the items were necessary, suggesting that additional interventions such as a didactic session or additional educational material on a targeted falls exam might be needed. Another explanation is that clinicians may not have benefited from the exam prompts, because they may have documented their exam after the visit. If this explanation were correct, then we might see improvements in the falls evaluation scores over time, because the clinicians might learn from the template.

This study has several limitations. The small number of clinicians and the use of only 1 medical center limit the generalizability of the findings. By their very nature, however, studies of feasibility should be performed on smaller samples to avoid wasting resources. Our study used SPs rather than real patients to test the effects of the templates on quality of care. As it was not possible to determine whether the condition-specific templates might actually lead to worse care, it was necessary to test the templates under experimental conditions before allowing the templates to be used on real patients.

This study summarizes the steps that were taken to develop computerized clinical tools for 2 syndromes that have poor quality of care: UI and falls. Future studies may consider using the approaches demonstrated in this study to develop other computerized condition-specific templates. Efforts should be made to increase the perceived usefulness and ease of use of the templates, as these characteristics may increase actual use of the templates.²⁵

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